

This closes the list of Mt. Toby ferns. There are only five more in this part of the state, *Woodwardia Virginica* and *W. angustifolia*, *Lygodium palmatum*, *Botrychium matricariaefolium* and *B. lanceolatum*. We cannot credit our beloved mountain with these, but are well satisfied with the thirty-seven to fifty kinds — according to the number of varieties that one chooses to admit — which we can collect in one day within the sweep of our one mile radius. Our Mt. Toby plants are more scattered than those of the charming Vermont fern garden, and we have to work harder for them, but, considering their number and the rarity of some, we think our paradise worthy of a place in a botanist's heart, beside that other delightful spot.

SPRINGFIELD, MASSACHUSETTS.

#### THE NORTHEASTERN CARICES OF THE SUBSECTION VESICARIAE.

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THE species of *Carex* ordinarily referred to the *Vesicariae* have been, with the possible exception of the *Rigidae* and the *Ovales*, the source of our greatest difficulty in studying that genus in Eastern America. Nearly all the forms now known in our flora have been from time to time associated with two or more so-called species, a divergence of treatment readily seen between the first and the sixth editions of Gray's Manual. In the first edition Carey recognized as American species *C. vesicaria*, L. and *C. ampullacea*, Good., of Europe. In subsequent editions other European species of the group, *C. rotundata*, Wahl., and *C. pulla*, Good., were recognized as belonging to our flora. Gradually, however, the American plants which once passed under those names, have been set apart, one by one, as distinctively American species, and for the American *Carex vesicaria* we have *C. monile*, Tuck.; for our *C. ampullacea*, *C. utriculata*, Boott; for American *C. rotundata* and *pulla*, *C. miliaris*, Michx. A study of some recently collected material has convinced the writer, however, that there is little reason for separating many American plants from the Old World species which they represent.

Recent authors have recognized in eastern America three species of the *saxatilis* (*pulla*) group. Of these *C. oligosperma* and *C. compacta* are clearly marked and perhaps of purely American range.

The other plants have all been referred to *C. miliaris*, Michx., an American species.

The botanical party<sup>1</sup> which recently explored a portion of Mt. Katahdin in Maine found two species of this group growing about the ponds upon the lower slopes of the mountain. One of these, a low plant with broad flat leaves and small purple spikes of nerveless perigynia is exactly the *C. saxatilis*, L. (*C. pulla*, Good.) of northern Europe. The other, a taller plant with yellowish-green or brownish spikes of nerved perigynia, is a good match for the original material of *C. Grahamsi*, Boott, of Scotland. Most of the Katahdin *C. saxatilis* is identical with the Hudson Bay plant so treated by Prof. Bailey, but a few plants found at a second station show the involute leaves characteristic of *C. miliaris*. Now by Carey and Gray and formerly by Prof. Bailey, *C. miliaris* was treated as a form of the European *C. saxatilis* (*C. pulla*), but recently Prof. Bailey has separated Michaux's *C. miliaris* as an American species taking for his distinctions the narrower leaves and paler narrower spikes of the latter plant. That the breadth of leaf is not constant is very apparent in specimens from Mt. Katahdin. The spike in good *C. miliaris* varies much in length and is often as short as in *C. saxatilis*, and the purple-brown perigynia of Robinson & Schrenk's Newfoundland plant (No. 87 — in all other points good *C. miliaris*) show that the color-character has little final value.

As already stated the taller plant growing by Depot Pond at the entrance to the Basins of Mt. Katahdin is *C. Grahamsi* of Scotland. This very rare species was described by Francis Boott from material collected by Wight on cliffs at Glen Phee, Clova, and the Katahdin plant is apparently identical with the original material, with which it has been carefully compared. The American plant described by Prof. Bailey as *C. miliaris*, var. (?) *aurea*, ordinarily has slightly narrower spikes than the Glen Phee and Katahdin specimens of *C. Grahamsi*, but most of the material of that form yet examined is immature. The perigynia, however, are inflated and nerved as in *C. Grahamsi* so that little hesitation is felt in placing the plants with that species. It is doubtful, though, whether most of the Rocky Mountain specimens which have sometimes been referred to *C.*

<sup>1</sup>J. R. Churchill, J. F. Collins, M. L. Fernald, G. G. Kennedy, and E. F. Williams.

*Grahami* are the same as the plant of Scotland and Northeastern America, a view already broached by Prof. Bailey.

Among the puzzling forms of this group collected by Messrs. A. H. & C. E. Smith at the outlet of Moosehead Lake was one plant which was doubtfully referred by Wm. Boott to *Carex rotundata*, Wahlenberg, of Scandinavia. The plant was so treated in the fifth edition of Gray's Manual, and in his Synopsis of the Genus *Carex*<sup>1</sup> Prof. Bailey interpreted it in a similar way. Subsequently, however, the American specimens have been referred by him to *C. miliaris*. *C. rotundata* of Wahlenberg has always been a little-known and poorly understood species. Much of the European material so named is referable to *C. saxatilis* and perhaps to our American *C. compacta*. In the Gray Herbarium there is, however, one sheet which may be taken as authentic. One of the specimens collected by Wahlenberg, himself, was sent by Francis Boott to his brother, William Boott. By these authors the specimen was accepted as authentic, as it was also by Olney who wrote upon the sheet "The plant from Wahl. just typical *C. rotundata*." A second specimen, from Greenland, is a perfect match for Wahlenberg's plant, and the Moosehead plant, though immature, is habitally like it, and the perigynia in their texture and nervation are essentially the same. It is still doubtful, however, whether the species is truly distinct from *C. saxatilis* and *C. miliaris*.

For many years the commonest form of the plant now passing as *Carex utriculata* was treated by both American and European authors as identical with the European *C. rostrata*, Stokes (*C. ampullacea*, Good.). Under the second of these purely synonymous names the plant was described by Carey in four editions of Gray's Manual. The plate of *C. ampullacea* in Francis Boott's great monograph was drawn from a Saskatchewan specimen, and Professor Bailey in 1886 treated the American and the European plants as identical. Subsequently, however, he maintained that the American plant is distinct from the European in its "grosser habit, lack of stoloniferous character, broader and proportionately shorter leaves, heavier and more scattered spikes, of which the lower are less peduncled, and much sharper scales."<sup>2</sup> A careful study of much material fails to convince the writer, however, that the medium-sized form of the Ameri-

<sup>1</sup> Proc. Am. Acad. xxii (1886), 67.

<sup>2</sup> Mem. Torr. Club, i. 60.

can plant (*C. utriculata*, var. *minor*, Boott) is in any way different from the European. In New England and adjacent Canada where the plant has been watched for some years the spikes vary extremely in size and compactness, and in these characters as well as in that of the scale the American plants are perfectly matched by the equally diverse European specimens. Professor Bailey's statement that the American plant is not stoloniferous cannot be founded upon study of carefully prepared material. It is true that most of the older herbarium specimens, hastily pulled up or broken off, show no stolons, but very many of recent collection, both in the Gray Herbarium and that of the New England Botanical Club, exhibit long stout stolons often a foot in length. This preservation of the stolons in the American specimens is doubtless due to the greater care exercised by recent botanists in the collection of their material. The original *Carex utriculata* of Boott is the coarsest form of the American plant, with perigynia often nearly 1 cm. long. As an extreme it is well marked but with many transitional specimens constantly occurring it cannot be maintained as a species and must be treated, as was done by Carey and formerly by Bailey, as a variety of the European species.

The plant described by Francis Boott as *Carex Olneyi* has been treated by Professor Bailey as a hybrid between *C. bullata* and *C. utriculata*. This view of the plant is based largely upon the fact that the Providence specimens are "sterile or nearly so." The same plant was collected abundantly by Wm. Boott in a swamp in eastern Massachusetts, and Mr. Canby gets it at different stations in Delaware. At these stations the plant though often sterile is no more so than is often the case in *C. utriculata* and various other species. These Carices being anemophilous must frequently be quite sterile, for, depending as they do upon gusts of wind to bring them pollen, large areas of the plant may readily remain unfertilized if the wind happens to take the pollen away from the colony, and especially if the plant is not a common one. Such sterile specimens of not only *C. Olneyi*, but *C. Grahmi*, *C. rostrata* and its var. *utriculata*, *C. bullata*, *C. monile*, and many other species are familiar to most botanists who know these plants in the field. The sterility of many specimens of *C. Olneyi* does not seem to the writer sufficient ground for treating it as a hybrid. Furthermore, the perigynia of this plant are smaller than are those of *C. bullata*, and if it be considered a hybrid we must

assume that its other parent is a plant with perigynia likewise smaller than in *C. bullata*. The only form of *C. utriculata* (as treated by Professor Bailey) which meets this demand is var. *minor*, Boott (*C. rostrata*, Stokes), which, as represented in the Gray Herbarium, seems to grow no further south than Connecticut. It hardly seems probable, then, that *C. Olneyi*, a plant occurring from eastern Massachusetts to Delaware, has any genetic affinity with *C. rostrata* (*C. utriculata* in part of Bailey). The species is, however, so close to *C. bullata* in its varying forms that it seems better treated merely as an extreme variation from that type.

In the first four editions of Gray's Manual Carey recognized *Carex vesicaria*, L., of Europe as an American plant and the plate of that species in Boott's Illustrations was drawn from an Ohio specimen. In the fifth edition of the Manual, however, Dewey's *C. Vaseyi* was taken up in its stead, a plant said to differ from the European *C. vesicaria* "in the more pointed scales and fewer-nerved perigynia tapering gradually into a longer beak." In 1886, however, Professor Bailey united with Tuckerman's *C. monile* the *C. Vaseyi* of Dewey, and since then the American plant which was long treated either as *C. vesicaria* or *C. Vaseyi* has passed as identical with Tuckerman's species. That the American *C. vesicaria* (*C. Vaseyi*) passes directly into *C. monile* there can be no doubt, but a study of European specimens from Francis Boott, Fries, Blytt, Hooker, and others shows no appreciable nor constant differences between the European and American plants. Furthermore good *C. monile* occurs in Transylvania at least, and a northern extreme of our American plant is well matched by *C. vesicaria*, var. *distenta*, Fries, of Scandinavia. *Carex Raeana*, Boott, a beautiful northern plant which apparently has been collected at only two stations, the original of Richardson near Methye Lake in Athabasca, and the shores of Lake St. John at the head of the Saguenay, is treated by Professor Bailey as a variety of *C. monile*. The typical *C. Raeana* is indeed very unlike the latter species, but Pres. Ezra Brainerd has collected at Lake St. John material which shows it to pass directly into typical *C. vesicaria*.

*Carex Tuckermani*, *C. bullata*, *C. retrorsa*, and *C. lurida* are apparently distinctive American plants, and their treatment is not obscured, like that of some of the species here discussed, by the rather scattered descriptions of European forms. *C. Tuckermani* and *C. bullata*

are tolerably constant in their tendencies, but *C. retrorsa* and *C. lurida* are excessively variable and present many puzzling forms. The treatment of them here adopted is essentially that already proposed by Professor Bailey.

In the preparation of the following synopsis the writer has been greatly assisted by Pres. Ezra Brainerd, who has kindly loaned his northern material of the group, and by Professor John Macoun, who has allowed the use of the extensive collections of the Geological Survey Department of Canada. These two collections have satisfactorily supplemented the representation in the Gray Herbarium and the herbarium of the New England Botanical Club.

#### SYNOPSIS OF SPECIES AND VARIETIES.

\* Perigynium not bladder-like nor conspicuously inflated; the beak with an entire or short-toothed orifice.

+ Perigynium nerved.

++ Spikes few-flowered, loose: mature perigynium rather firm, 5 or 6 mm. long.

*C. OLIGOSPERMA*, Michx. Slender and tall (2.5 dm. or less high), with involute leaves: staminate spike usually 1; pistillate spikes 1 or 2, very rarely 3, at most 1.5 cm. long: the shining conic-ovoid perigynium ascending, nearly twice as long as the broad blunt purple-tinged scale.—Fl. ii. 174; Carey in Gray, Man. 567; Boott, Ill. i. 25, t. 63; Bailey, Proc. Am. Acad. xxii. 64, & Mem. Torr. Club, i. 64. *C. Okesiana*, Dewey, Sill. Jour. xiv. 351. *C. Despreauxii*, Steud. Syn. Pl. Cyp. 237 (acc. to Bailey, l. c. 69).—Bogs and wet shores, Labrador and Newfoundland to Pennsylvania, Minnesota, and the Saskatchewan.

++ ++ Spikes dense: perigynium smaller.

= Leaves flat.

a. Pistillate spike purplish: perigynium globose-ovoid, abruptly short-beaked, membranaceous, squarrose-spreading.

*C. COMPACTA*, R. Br. Rather stout, 2 to 4 dm. high: staminate spike 1 (rarely 2), short-peduncled; pistillate spikes 1 or 2, very dense, sessile, erect, 1 to 3 cm. long, 7 to 9 mm. thick.—R. Br. in Ross, Voy. App. cxliii (nomen nudum), & in Dewey, Am. Jour. Sci. xxvii. 237, t. U, fig. 63; Boott, Ill. iv. 156, t. 502; Bailey, Proc. Am. Acad. xxii. 66, in part, & Mem. Torr. Club, i. 39. *C. membranacea*, Hook. in Parry, 2nd Voy. App. 406; Dewey, Am. Jour. Sci. xxix, 247, t. X, fig. 73. *C. saxatilis*, var. *compacta*, Dewey, Am. Jour. Sci. xi. 310. *C. membranopacta*, Bailey, Bull. Torr. Club. xx.

428. — Baffin Land (*Capt. John Ross*) and Northern Labrador (*Turner*) to Great Bear Lake (*Richardson*): perhaps also in northern Europe.

b. Pistillate spike yellow-green or merely purple-tinged: perigynium ovate, tapering gradually to the longer beak, ascending (*C. monile*, var. *Raeana* might be looked for here).

*C. GRAHAMI*, Boott. Rather tall (4 to 7 dm.) and slender: staminate spikes 1 or 2, peduncled; pistillate spikes 1 or 2 (rarely 3), the lowest mostly short-pedicelled, slightly spreading or ascending, 1 to 3 cm. long, 6 to 9 mm. thick: perigynium submembranaceous, few-nerved, 4 or 5 mm. long, twice as long as the blunt or acute ovate pale or purple-tinged scale. — *Trans. Linn. Soc.* xix. 215; *Syme, Eng. Bot.* x. 172, t. 1684; *A. Bennett, Jour. Bot.* xxxv. 263. *C. saxatilis*, L., var. *Grahami*, Hook. & Arn. *Brit. Fl.* ed. 8, 510; *Bailey, Mem. Torr. Club*, i. 38, in part. *C. pulla*, Gray, *Man.* ed. 5, 602, not Good. *C. miliaris*, Michx., var.? *aurea*, *Bailey*, l. c. 37. *C. Raeana*, *Britton & Brown, Ill. Fl.* i. 295, fig. 682, not Boott. — Shores and marshy ground, NEWFOUNDLAND, Exploits River (*Robinson & Schrenk*, no. 236): QUEBEC, East Main River (*A. H. D. Ross*); Lake St. John (*G. G. Kennedy, E. Brainerd*): NOVA SCOTIA, North Ingonish, Cape Breton (*J. Macoun, Herb. Geol. Surv. Dept. Can.* no. 20,838): NEW BRUNSWICK, Kennebeckasis (*J. Fowler*): ONTARIO, Chaudiere Falls, Ottawa (*Macoun, Herb. Geol. Surv. Dept. Can.* no. 7438, in part): MAINE, margin of Depot Pond, entrance to Basins of Mt. Katahdin (*J. R. Churchill, E. F. Williams & M. L. Fernald*); outlet of Moosehead Lake (*A. H. & C. E. Smith*): BRITISH COLUMBIA, Donald, Columbia Valley (*John Macoun*): SCOTLAND, Glen Phee, Clova (*Wight*); and reported from a station in Perth.

= = Leaves soon becoming involute.

*C. ROTUNDATA*, Wahlb. Rather slender, 6 dm. or less high: staminate spike 1 (rarely 2 or 3), short-peduncled; pistillate spikes 1 or 2, sessile, short and compact, 8 to 13 mm. long, 6 to 8 mm. wide, the lower subtended by a divergent or somewhat ascending bract 4 or 5 cm. long: perigynium pale or ferruginous, plump, membranaceous, few-nerved, subglobose-ovate, about 3 mm. long, tapering abruptly to the very short subentire or short-toothed beak, one half longer than the ovate purplish scale. — *Act. Holm.* 1803, 153, & *Fl. Lap.* 235; *Gray, Man.* ed. 5, 602; *Bailey, Proc. Am. Acad.* xxii. 67, in part, & *Mem. Torr. Club*, i. 39. — This name has been applied to numerous plants which are very different from the original plant of Wahlenberg. A specimen in the Gray Herbarium collected by Wahlenberg, himself, described above, and matched by a Greenland plant (*Warming & Holm*), is essentially the plant from MAINE, outlet of Moosehead Lake, Aug. 24, 1867 (*C. E. Smith*). A specimen from the upper Mackenzie (*Tyrrell*) is probably the same.

- + Perigynium nerveless (or faintly nerved in exceptional specimens of var. *miliaris*).

*C. SAXATILIS*, L. Low (2 or 3 dm. high) with flat leaves, 0.5 cm. or less wide, nearly or quite equalling the culm: staminate spike 1 (rarely 2), short-peduncled or sessile; pistillate spikes purplish, 1 to 3, sessile or the lowest short-peduncled, subglobose or short-oblong, 0.5 to 2 cm. long, 5 to 8 mm. thick: perigynium purplish or purple-tinged, usually nerveless, ovate, 3 or 4 mm. long, tapering gradually to a short subentire beak, slightly longer than the acutish or blunt purple scale: stigmas usually 2. — Sp. 976; Bailey, Proc. Am. Acad. xxii. 65, & Mem. Torr. Club, i. 37. *C. pulla*, Good. Trans. Linn. Soc. iii. 78, t. 14; Smith, Eng. Bot. xxix. t. 2045; Fl. Dan. xvi. t. 2850. — Northern Europe and Greenland: HUDSON BAY, North and South Twin Islands (*J. M. Macoun*): UNGAVA, Prince George's Sound (*R. Bell*, Herb. Geol. Surv. Dept. Can. no. 18, 795); Ungava River (*Spreadborough*, Herb. Geol. Surv. Dept. Can. no. 13,605): LABRADOR, Battle Harbor (*A. C. Waghorne*): MAINE, margin of pond, Chimney Basin, Mt. Katahdin, alt. 925 m. (*J. R. Churchill, E. F. Williams & M. L. Fernald*).

Var. *MILIARIS*, Bailey. Slender and taller, 2.5 to 6 dm. high: leaves nearly filiform: pistillate spikes mostly paler and more slender, 1 to 2.5 cm. long, 3 to 7 mm. thick. — Bot. Gaz. ix. 120, & Proc. Am. Acad. xxii. 66. *C. miliaris*, Michx. Fl. ii. 174; Boott, Ill. i. 73, t. 200, fig. 2; Bailey, Mem. Torr. Club, i. 35 & in Gray, Man. ed. 6, 593. *C. pulla*, Good., var.? *miliaris*, Gray, Man. ed. 5, 602. *C. miliaris*, var. *obtusata*, Bailey, Mem. Torr. Club, i. 36. — Margins of rivers and lakes from Central Maine northward, rare. NEWFOUNDLAND (*La Pylaie*); Exploits River (*Robinson & Schrenk*, no. 87); Grand Lake & Coal River (*A. C. Waghorne*, nos. 20, 23): QUEBEC, East Main River (*A. H. D. Ross*); Lake St. John (*A. H. Smith, G. G. Kennedy, Ezra Brainerd*): NEW BRUNSWICK, Rothsay & Richibucto (*J. Fowler*); Drury's Cove, St. John (*Wm. Boott*): MAINE, outlet of Moosehead Lake (*A. H. & C. E. Smith*).

Var. *rhomalea*. Coarser throughout than the last, mostly taller: the stouter culm rather thick at base: the coarser leaves involute: spikes mostly thicker and longer. — *C. miliaris*, var. *major*, Bailey, Mem. Torr. Club, i. 36. — LABRADOR (*Turner*); Seal Lake (*Spreadborough*, Herb. Geol. Surv. Can. no. 13,481): QUEBEC, Jupiter River, Anticosti (*J. Macoun*); Lake Mistassini (*J. M. Macoun*): MAINE, outlet of Moosehead Lake (*T. C. Porter*).

\* \* Perigynium turgid, often bladder-like; the beak sharply bidentate.

+ Scales smooth or only the lowest serrulate.

++ Perigynium turgid, but not conspicuously bladder-like: culm thick and spongy at base, generally smooth and bluntly angled above: leaves prominently nodulose.



*C. ROSTRATA*, Stokes. Culm 0.3 to 1 m. high, rather stout: leaves elongated, flat, usually equalling or exceeding the culms, pale green or glaucous, 0.2 to 1 cm. wide: staminate inflorescence mostly peduncled, of 2 to 4 distinct spikes; pistillate spikes mostly 2 to 4, sessile or the lower peduncled, cylindrical, dense, 2 to 10 cm. long, 6 to 12 mm. thick: perigynium ascending or slightly spreading, ovate, flask-shaped, 3 to 6 mm. long, rather abruptly contracted to the cylindrical beak, somewhat exceeding the bluntish or acute oblong or lanceolate purple-tinged scale. — Stokes in With. Arrang. Brit. Pl. ed. 2, 1059; Bailey, Proc. Am. Acad. xxii. 67, & Mem. Torr. Club, i. 59. *C. ampullacea*, Good. Trans. Linn. Soc. ii. 207; Eng. Bot. xi. t. 780; Fl. Dan. xiii. t. 2248; Reichenb. Ic. Fl. Germ. viii. t. 277; Carey in Gray, Man. 566; Boott. Ill. iv. t. 501. *C. utriculata*, Boott, var. *minor*, Boott, Ill. i. 14; Bailey, Mem. Torr. Club, i. 60, & in Gray, Man. ed. 6, 594. — Very wet swamps and in shallow water, Newfoundland and Labrador to Connecticut, New York, Illinois, the Saskatchewan and Vancouver, south in the mountains to Utah and California: Europe.

Var. *UTRICULATA*, Bailey. Coarser; the mature spikes 1 to 2 cm. thick, often longer than in the species: perigynium elliptic-ovate to oblong, 0.5 to 1 cm. long, tapering gradually to the beak. — Proc. Am. Acad. xxii. 67. *C. utriculata*, Boott in Hook. Fl. Bor.-Am. ii. 221, & Ill. i. 14, t. 39; Gray, Man. ed. 5, 600, in part; Bailey in Gray, Man. ed. 6, 594, in part; Britton & Brown, Ill. Fl. i. 297, in part. *C. ampullacea*, Good., var. *utriculata*, Carey in Gray, Man. 566. — Newfoundland to New Jersey, Ohio, and the Saskatchewan; in the Rocky Mountains to Utah, and on the Pacific Slope.

Var. *ambigens*. Very slender, 3 to 5 dm. high, culms barely 1 mm. in diameter below the spikes: leaves 2 to 5 mm. wide: staminate spikes 1 or 2; pistillate 1 to 3, globose or short-oblong, 1 to 2.5 cm. long: perigynium as in the species. — NEW BRUNSWICK, South Tobique Lakes, July 18, 1900 (*G. U. Hay*, no. 41): MAINE, sandy shore of St. John River, St. Francis, June 18, 1898 (*M. L. Fernald*, nos. 2076, 2077). Habitally resembling *C. monile*, but with the stiffer habit, spongy culms smooth and bluntly angled above, the nodulose leaves and the perigynia of *C. rostrata*.

++ ++ Perigynium bladder-like (except in *C. vesicaria*, var. *Raeana*): culm comparatively slender, sharp-angled above, often harsh: leaves slightly or not at all nodulose.

= Beak of the perigynium usually slightly roughened or serrulate (see exceptional specimens of *C. retrorsa*).

*C. BULLATA*, Schkuhr. Extremely slender, 7 dm. or less high. the long leaves 2 to 4 mm. wide: staminate spikes mostly 2 or 3, long-peduncled; pistillate spike 1 (or if 2, remote), globose or thick-cylindrical, 1 to 4 cm. long, 1.5 to 2 cm. thick, rather loosely flowered:

perigynium strongly nerved, firm and shining, orbicular to ovate, very turgid, 6 to 9 mm. long, contracted to a slender conic-cylindric short-toothed beak, spreading and much exceeding the acute or bluntish scale. — Riedgr. Nachtr. 85, t. Uuu. fig. 166; Carey in Gray Man. 566; Boott, Ill. i. 15, t. 41; Bailey, Proc. Am. Acad. xxii. 68. *C. cylindrica*, Schw. acc. to Boott, l. c. *C. Greenii*, Boeckeler, Flora, 1858, 649. — Swales and wet meadows, Southern Maine to Pennsylvania and So. Carolina. Occasionally smooth-beaked specimens occur but these can be distinguished from *C. Tuckermanni* by the firm texture of the perigynium and its peculiar yellow-green color.

Var. **Olneyi**. Coarser, the leaves 4 to 6 mm. wide: pistillate spikes mostly 2, cylindric, more densely flowered, 2.5 to 5 cm. long, 1 to 1.5 cm. thick: perigynium duller, more ascending and smaller than in the species. — *C. Olneyi*, Boott, Ill. i. 15, t. 42; Gray, Man. ed. 3, xcvi. *C. bullata* × *utriculata*, Bailey, Proc. Am. Acad. xxii. 68, & in Gray, Man. ed. 6, 595. *C. monile*, Britton, Bull. Torr. Club, xxii. 221, not Tuck. — Massachusetts to Delaware. MASSACHUSETTS, Tophet Swamp, Lexington, (*Wm. Boott*); Southbridge (*R. M. Harper*): RHODE ISLAND, Providence (*S. T. Olney*): DELAWARE, Blackbird and Townsend (*W. M. Canby*).

*C. LUPULINA* × *BULLATA*, Fernald. Coarse as in *C. lupulina*: pistillate spikes 3 cm. broad: perigynium firm as in *C. bullata*, but large and dull as in *C. lupulina*. — Rhodora, ii. 170. — MASSACHUSETTS, Medford (*Wm. Boott*).

= = Beak of perigynium smooth (rarely a little serrulate in *C. retrorsa*).

a. Mature perigynium 5 to 6.5 mm. thick.

*C. TUCKERMANI*, Dewey. Culms slender, 1 m. or less long, forming loose stools: leaves 3 to 5 mm. wide, the bracts very leaf-like and usually much exceeding the culm: staminate spikes 2 or 3, long-peduncled; pistillate 2 or 3, slender-peduncled or the upper sessile, cylindric-oblong, 2 to 6 cm. long, 1.2 to 1.8 cm. thick, loosely flowered: perigynium glossy, extremely membranaceous and bladder-like, strongly nerved, globose-ovate, 1 cm. long, tapering gradually to the slender cylindric beak, much exceeding the oblong-ovate acute or acuminate scale. — Am. Jour. Sci. xlix. 48, fig. 117; Boott, Trans. Linn. Soc. xx. 115, & Ill. i. 15, t. 40; Gray, Man. ed. 5, 601; Bailey, Proc. Am. Acad. l. c. & Mem. Torr. Club, i. 72. *C. bullata*, Dewey, Am. Jour. Sci. ix. 71, not Schkuhr. *C. cylindrica*, Carey in Gray, Man. 566. — Rich alluvium, New Brunswick, Maine, the White Mountains, and the Connecticut Valley to New Jersey, Indiana, Minnesota, Ontario and Lake St. John, Quebec.

b. Mature perigynium not more than 4 mm. thick.

1. Perigynium ascending, straight (*C. retrorsa*, var. *Macounii* may be looked for here).

*C. VESICARIA*, L. Comparatively slender, 0.4 to 1 m. high, the

culms sharply angled and generally roughish above, usually overtopped by the bracts: leaves 4 to 7 mm. wide, loosely ascending or spreading, but of firm texture: staminate spikes mostly 2 or 3, peduncled; pistillate spikes 2 (rarely 1) or 3, remote, sessile or short-peduncled, cylindric, 2 to 7 cm. long, 1 to 1.5 cm. thick: perigynium slightly turgid, ovate- to oblong-conic, tapering gradually to the slender beak, when mature 7 to 9 mm. long, twice exceeding the ovate-lanceolate acute or acuminate scale. — Sp. 979; Fl. Dan. iv. t. 647; Eng. Bot. xi. t. 779; Reichenb. Ic. Fl. Germ. viii. t. 276; Carey in Gray, Man. 565; Boott, Ill. iv. t. 536. *C. monile*, Dewey, Am. Jour. Sci. xlix. 47, fig. 116; Bailey, Proc. Am. Acad. xxii. 67, & in Gray, Man. ed. 6, 594, in part; not Tuck. *C. sp.* Boott, Ill. i. 28. *C. vesicaria*, var. *cylindrica*, Dewey, l. c. as syn. *C. Vaseyi*, Dewey, l. c. ser. 2, xxix. 347; Gray, Man. ed. 5, 600. — A common Old World species; less common in America. QUEBEC, Lake St. John (*E. Brainerd*): MAINE, Mechanic Falls (*J. A. Allen*): NEW HAMPSHIRE, Franconia (*E. & C. E. Faxon*): VERMONT, Middlebury (*E. Brainerd*): MASSACHUSETTS, Medford (*Wm. Boott*): Dedham (*Wm. Boott, H. A. Young*): RHODE ISLAND, Seekonk River (*S. T. Olney*): CONNECTICUT, Plainville (*C. Wright*): Southington (*C. H. Bissell*): NEW YORK, Pen Yan (*H. P. Sartwell*, exsic. no. 152, etc.): PENNSYLVANIA, Huntingdon Co. (*T. C. Porter*): OHIO (vide Boott, Ill. t. 536): ONTARIO, Ottawa (*Wm. Scott*): Nipigon River (*J. Macoun*): also in the northwestern states in various forms.<sup>1</sup>

Var. **monile**. Leaves 2 to 5 mm. wide: pistillate spikes similar: the perigynium more turgid, roundish-ovate, about 6 mm. long, rather abruptly tapering to the beak.— *C. monile*, Tuck. Enum. Meth. 20; Carey in Gray, Man. 565; Boott, Ill. i. 28, t. 72; Bailey, Proc. Am. Acad. l. c. & Mem. Torr. Club, i. 39.— Meadows and low ground, Newfoundland to the Saskatchewan, Kentucky and Missouri; also Transylvania at Csik (*Barth*).

Var. **jejuna**. Smaller and more slender; leaves mostly 3 mm. wide: pistillate spikes thinner, 5 to 8 mm. thick: perigynium as in the last, 4 or 5 mm. long.— *C. monile*, var. *minor*, Olney in herb.; Bennett, Pl. Rhode Isl. 50 (as nomen nudum).— QUEBEC, Lakes Edward and St. John, Aug. 1896 (*E. Brainerd*): NEW BRUNSWICK, South Tobique Lakes, July 18, 1900 (*G. U. Hay*, no. 57): MAINE, St. Francis, June 18, 1898 (*M. L. Fernald*, no. 2075); Madawaska Lake, Aug. 2, 1900 (*E. F. Williams*): NEW HAMPSHIRE, North

<sup>1</sup> Although the West-American forms of the group are not specially discussed in this paper it is worthy of note that Brewer's no. 1654 from the Yosemite Valley is exactly *C. vesicaria*, var. *latifolia*, Blytt, Norg, Fl. i. 252, one of Blytt's original specimens matching the Californian material in every detail. Superficially the plant resembles *C. rostrata*, var. *utriculata*, but it has the sharply angled harsh culm of *C. vesicaria*.

Conway, Aug. 27, 1855 (*Wm. Boott*); Echo Lake, North Conway, June 8, 1878, near Gate of the Notch, July 7, 1878, and between Bethlehem and Fabyans, July 5, 1879 (*E. & C. E. Faxon*): VERMONT, Island Pond, July 4, 1854 (*Wm. Boott*); Gardner's Island, Lake Champlain, June 26, 1877 (*C. G. Pringle*); E. Wallingford and Bloomfield, 1899 (*W. W. Eggleston*, nos. 1659, 1667): MASSACHUSETTS, Framingham, July 7, 1897 (*E. C. Smith*, no. 653): RHODE ISLAND, banks of Seekonk River, June 15, 24, 1867 (*S. T. Olney*): CONNECTICUT, Hartford, June, 1879 (*C. Wright*): NEW YORK, Sand Lake (*C. H. Peck*); Raquette Falls, July 11, 1899 (*Rowlee, Wiegand, & Hastings*): ONTARIO, Nipigon River, July 22, 1884 (*J. Macoun*).

Var. *DISTENTA*, Fries. Nearly as slender as the last: pistillate spikes 1 or 2, short and thick, 1 to 2.5 cm. long, 1 to 1.3 cm. thick: perigynium as in var. *monile*.—Herbar. norm. Fasc. 15, no. 84, acc. to Blytt, Norg. Fl. i. 253. *C. Friesii*, Blytt, l. c.—NORWAY (*Blytt*): UNGAVA, along Ungava River (*Spreadborough*, Herb. Geol. Surv. Dept. Can. no. 13,647): NEWFOUNDLAND, Exploits River, with *C. saxatilis*, var. *miliaris* and *C. Grahami*, Aug. 13, 1894 (*Robinson & Schrenk*); Grand Lake (*Waghorne*): QUEBEC, Rupert River (*J. M. Macoun*, Herb. Geol. Surv. Can. no. 20,241): MAINE, outlet of Moosehead Lake (*E. & C. E. Faxon*); Orono (*M. L. Fernald*). Closely resembling *C. Grahami*, but in its acute scale and sharply long-toothed beak clearly an extreme of *C. vesicaria*.

Var. *Raeana*. Very slender, 4 to 6 dm. high: leaves 2 mm. wide, tending to become involute at tip: pistillate spikes very slender, at most 3 or 4 cm. long, 4 to 8 mm. wide: perigynium scarcely at all inflated, oblong-ovate to oblong-lanceolate, tapering gradually to the beak, 4 to 6 mm. long, one-third longer than the acuminate scale.—*C. Raeana*, Boott, in Rich. Arct. Exped. ii. 344, & Ill. i. 25, t. 64; Bailey, Proc. Am. Acad. xxii. 65, in part. *C. monile*, var. *Raeana*, Bailey, Mem. Torr. Club, i. 39.—ATHABASCA, Methye Portage, Methye Lake [Lac la Loche] (*Sir John Richardson*): QUEBEC, Roberval, Lake St. John, Aug. 22, 24, 1896 (*Ezra Brainerd*).

2. Perigynium retrorse or wide spreading (ascending in var. *Macounii*), slightly falcate.

*C. RETRORSA*, Schwein. Rather stouter than the last species, 1 m. or less high: leaves ribbon-like, of very soft texture, mostly 0.5 to 1 cm. wide; the bracts very much overtopping the culm: staminate spikes 1 to 4, sessile or short-peduncled, often pistillate at base; pistillate spikes 3 to 8, mostly clustered at the tip, sessile or short-peduncled, spreading, or the lower long-peduncled and remote, frequently compound, 1.5 to 5 cm. long, 1.5 to 2 cm. thick: perigynium very thin and soft, reflexed, conic-ovate, long-beaked, 8 to 10 mm. long, much exceeding the acuminate scale.—Ann. Lyc. N. Y. i. 71; Schw. & Torr. Ann. Lyc. N. Y. i. 366, t. 28, fig. 2; Carey in Gray, Man. 565; Boott, Ill. ii. 93, t. 276; Bailey, Proc. Am. Acad. xxii. 68, &

in Gray. Man. ed. 6, 595. *C. reversa*, Spreng. Syst. iii. 827. — Wet places, Gulf of St. Lawrence to the Saskatchewan and British Columbia, south to Pennsylvania, Michigan, Idaho and Oregon.

Var. **HARTII**, Gray. Pistillate spikes scattered, long-peduncled: perigynia mostly wide-spreading. — Man. ed. 5, 600; Bailey, Proc. Am. Acad. l. c. *C. Hartii*, & var. *Bradleyi*, Dewey, Am. Jour. Sci. ser. 2, xli. 226. — Rather local, NEW HAMPSHIRE, Jackson (*Wm. Boott*): VERMONT, Pomfret, (*A. P. Morgan*): NEW YORK, Jefferson Co. (*Crawe*); Dundee, Yates Co. (*S. Hart Wright*); Greece (*S. D. Bradley*): ONTARIO, Seymour and Stirling (*J. Macoun*): MICHIGAN, Agricultural College (*C. F. Wheeler*); Lansing (*L. H. Bailey*).

Var. **Macounii**. Similar to the latter, but perigynia ascending. — *C. Macounii*, Dewey, l. c. 228. *C. lupulina*, var. *gigantoidea*, Dewey, l. c. 328. *C. lurida* × *retrorsa*, Bailey, Bot. Gaz. xiii. 88. *C. lupulina* × *retrorsa*, Dudley, Cayuga Fl. 119. — NEW YORK (fide *Dudley*, l. c.): ONTARIO, Seymour, Northumberland Co., July 15, 1865, July 16, 1867, July 15, 1873, and Belleville, July, 1866 (*J. Macoun*): MICHIGAN, Alma, Aug. 20, 1893 (*C. A. Davis*).

*C. RETRORSA* × *UTRICULATA*, Fernald. Spikes and perigynia as in *C. rostrata*, var. *utriculata*, but the latter strongly retrorse. — Rhodora, ii. 170. — CONNECTICUT (*C. Wright*).

+ + Scales mostly with thin serrulate awns.

*C. LURIDA*, Wahl. Culms mostly smooth and obtusely angled, 1 m. or less high: leaves loose, scabrous, broad and flat, 4 to 6 mm. wide; the bracts leaf-like, elongated: staminate spike usually 1, elongated, peduncled or sessile, commonly subtended by a very narrow bract; pistillate spikes 2 or 3 (rarely 4), subapproximate, the upper sessile, the lower short-peduncled and when more than 2 somewhat remote, very comose, oblong-cylindric, mostly 3 to 6 cm. long, 1.5 to 2 cm. thick: perigynium very thin and bladder-like, about 10-nerved, globose-ovate, 7 to 10 mm. long, the body barely equalling the slender long-conic beak. — König. Acad. Hand. xxiv. 153 (1803), fide Bailey, Mem. Torr. Club, i. 10, 11. *C. tentaculata*, Muhl. in Willd. Spec. iv. 266; Schk. Riedgr. Nachtr. 53, t. Ggg. fig. 130; Carey in Gray, Man. 563; Boott, Ill. ii. 94, t. 277; Bailey, Proc. Am. Acad. xxii. 69. *C. rostrata*, Willd. Spec. iv. 282; Schk. l. c. 54, t. Hhh. fig. 134; not Stokes. *C. tentaculata*, var. *rostrata*, Pursh, Fl. i. 41. *C. gigantea*, Kunth, Enum. ii. 503 (fide Bailey). *C. Purshii*, Olney, Exsicc. fasc. i. no. 30. *C. Beyrichiana*, Boeckl. Linnaea, xli. 239 (fide Bailey). — A very common species in low ground, Annapolis Co., Nova Scotia, and Queens Co., New Brunswick to Ontario, Georgia, Louisiana, and Texas. Passing by numerous transitions to several formal varieties: —

Var. **EXUDANS**, Bailey. Spikes far apart, the lower very remote on elongated capillary peduncles. — Bailey in Britton & Brown, Ill. Fl. i. 299. — Range of species.

Var. FLACCIDA, Bailey. Spikes rather crowded at the tip of the culm, none remote, usually more ascending and less comose than in the species. — Mem. Torr. Club, i. 73. — Range of species.

Var. PARVULA, Bailey. Most of the spikes subglobose or short-oblong, 1 or 2 cm. long. — Bull. Torr. Club, xx. 418. *C. tentaculata*, var. *parvula*, Paine, Cat. Pl. Oneida, 105. — Range of species.

Var. GRACILIS, Bailey. The most slender form: leaves 2 or 3 mm. wide: spikes as in the species, but more slender, 1 to 4 cm. long, 1 to 1.3 cm. broad: perigynium 5 to 7 mm. long. — Mem. Torr. Club, i. 11, & in Gray, Man. ed. 6, 595. *C. tentaculata*, var. *gracilis*, Boott, Ill. ii. 94; Bailey, Proc. Am. Acad. l. c. *C. Baileyi*, Britton, Bull. Torr. Club, xxii. 220, & in Britton & Brown, l. c. fig. 694. — Mostly in mountainous regions, MAINE, east base of Mt. Katahdin and at Farmington (*M. L. Fernald*): NEW HAMPSHIRE, Franconia (*Wm. Boott*): VERMONT, Lake Dunmore, etc. (*A. W. Chapman*); Willoughby Lake (*Wm. Boott* etc.); Underhill (*G. G. Kennedy*); Smugglers Notch (*Churchill*, etc.); Waterbury and Ripton (*E. Brainerd*); No. Pomfret (*A. P. Morgan*); Townshend (*L. H. Bailey*): PENNSYLVANIA Delaware Water Gap (*Wm. Boott*): reported from the Southern Alleghanies.

*C. LURIDA* × *LUPULINA*, Bailey. Spikes subapproximate, 2 to 2.5 cm. broad: perigynium ascending, ovate-conic, about 18-nerved, 1 to 1.2 cm. long. — Mem. Torr. Club, i. 73, & in Gray, Man. ed. 6, 595. *C. tentaculata*, var. *rostrata*, Sartwell, exsicc. no. 138. *C. tentaculata*,? var. *altior*, Boott, Ill. ii. 94, t. 278. *C. tentaculata* × *lurida*, Bailey, Proc. Am. Acad. l. c. 69, in part. — MASSACHUSETTS, Medford (*Wm. Boott*); Amherst (*E. Tuckerman*): CONNECTICUT, Groton (*C. B. Graves*); Wethersfield (*C. Wright*, acc. to Bailey): NEW YORK, Pen Yan, (*Sartwell*, no. 138). Sartwell's specimens have some good achenes, and the plant, though of hybrid origin, may now be a fertile form.

*C. SCHWEINITZII*, Dewey, in habit closely approaches slender-spiked forms of *C. rostrata*, and in its scales it is very close to *C. lurida*. Its perigynia are slightly inflated, in this also approaching the *Vesicariae*, but they are strongly costate as in the *Pseudocyperae*, and the plant is best treated, for the present at least, as a transitional species between these two groups.

GRAY HERBARIUM.